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Bibliography

(19) [Publication country] Japan Patent Office (JP)
(12) [Kind of official gazette] Open patent official report (A)
(11) [Publication No.] JP,11-271501,A
(43) [Date of Publication] October 8, Heisei 11 (1999)
(54) [Title of the Invention] An ultraviolet absorption nature plastic lens and its manufacture approach
(51) [International Patent Classification (6th Edition)]

G02B 1/04
B29D 11/00
C08G 18/38
G02B 3/00
G02C 7/10
// C09K 3/00 104
B29K 81:00

[FI]

G02B 1/04
B29D 11/00
C08G 18/38
G02B 3/00 Z
G02C 7/10
C09K 3/00 104 C

[Request for Examination] Un-asking.

[The number of claims] 4

[Mode of Application] OL

[Number of Pages] 10

(21) [Application number] Japanese Patent Application No. 10-69151

(22) [Filing date] March 18, Heisei 10 (1998)

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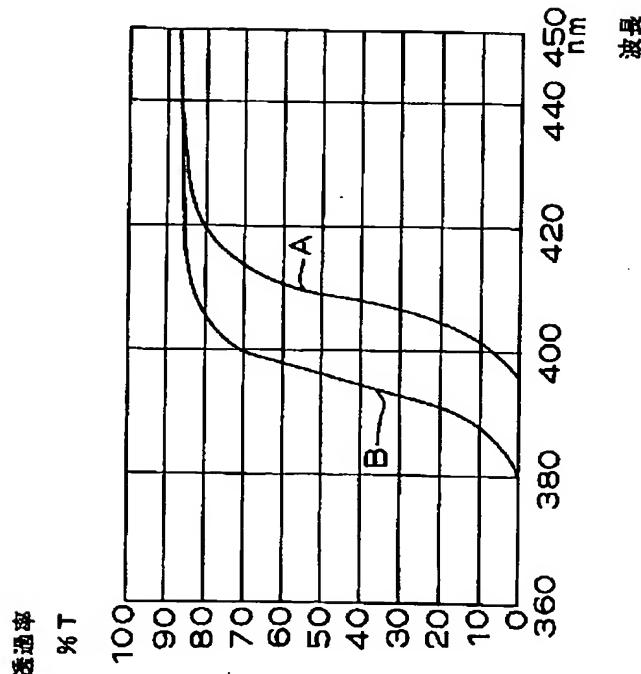
Epitome

(57) [Abstract]

[Technical problem] The ultraviolet absorption nature plastic lens which can absorb the ultraviolet rays of full wave length almost completely is obtained. This lens is obtained with sufficient productivity.

[Means for Solution] Molecular weight considers as the plastic lens which contains 360 or less ultraviolet ray absorbent at a rate of 0.7 – 5 weight section to the raw material monomer 100 weight section. Before putting in a polymerization catalyst, an ultraviolet ray absorbent is mixed to a raw material monomer.

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CLAIMS

[Claim(s)]

[Claim 1] The ultraviolet absorption nature plastic lens with which molecular weight is characterized by containing 360 or less ultraviolet ray absorbent at a rate of 0.7 – 5 weight section to the raw material monomer 100 weight section.

[Claim 2] The ultraviolet absorption nature plastic lens according to claim 1 said whose ultraviolet ray absorbent is a benzotriazol system compound.

[Claim 3] The ultraviolet absorption nature plastic lens according to claim 1 or 2 with which said raw material monomer uses mixture of the poly isocyanate compound and the Pori thiol compounds as a principal component.

[Claim 4] The manufacture approach of the ultraviolet absorption nature plastic lens characterized by having the 1st mixing process with which molecular weight mixes 360 or less ultraviolet ray absorbent at a rate of 0.7 – 5 weight section to the raw material monomer 100 weight section, the 2nd mixing process which adds a polymerization catalyst after said 1st mixing process, and the polymerization process to which the polymerization of said raw material monomer is carried out after said 2nd mixing process.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the ultraviolet absorption nature plastic lens which protects an eye from ultraviolet rays, and its manufacture approach.

[0002]

[Description of the Prior Art] Plastics deteriorates by light, especially ultraviolet rays, and it is known that yellowing etc. will arise. In order to prevent degradation by the ultraviolet rays of a

direct this slack plastic lens to sunlight, an ultraviolet ray absorbent is added in a monomer, a polymerization is performed, and making an ultraviolet ray absorbent contain in a plastic lens is performed very more ordinarily than before.

[0003] If the content of the ultraviolet ray absorbent in this case is enough if the ultraviolet rays of short wavelength are absorbable from a viewpoint of degradation prevention of a plastic lens, and it is made high concentration not much, in order that a plastic lens may yellow-ize, they are 0.05 – 0.2 weight section extent and a minute amount to the raw material monomer 100 weight section (reference, such as JP,1-230003,A and JP,5-164902,A).

[0004]

[Problem(s) to be Solved by the Invention] However, the increment in the amount of ultraviolet rays which reaches on the ground by destruction of an ozone layer is made into a problem, and the harmful nature to the body came to be cried for in recent years.

[0005] It is said that it will tend to become a cataract also in the body if especially an eye is a part which is easy to be influenced of ultraviolet rays and it is exposed to ultraviolet rays over a long period of time beyond the need.

[0006] Ultraviolet rays are about 180–400nm electromagnetic waves. Among these, although ultraviolet rays with a wavelength of 380nm or less were absorbable enough by addition of the minute amount of the ultraviolet ray absorbent to the plastic lens mentioned above, to ultraviolet rays with a long wavelength of 380–400nm, its absorptivity ability was low. However, 380–400nm ultraviolet rays have high permeability, and since it is harmful to an eye, in current, it is requested that all the ultraviolet rays containing still such long wavelength are absorbed almost completely.

[0007] This invention was made in view of the above-mentioned request, and aims at offering the ultraviolet absorption nature plastic lens which can absorb all ultraviolet rays effectively, and its manufacture approach.

[0008]

[Means for Solving the Problem] this invention person repeated examination wholeheartedly in order to attain the above-mentioned purpose.

[0009] In order to give ultraviolet absorption ability to a plastic lens, it scours mainly with the following sinking-in approach, and there is the crowded method.

[0010] The sinking-in approach is an approach of dissolving an ultraviolet ray absorbent in water or an organic solvent, and the plastic lens fabricated in the liquid containing this ultraviolet ray absorbent being immersed, and infiltrating an ultraviolet ray absorbent into a plastic lens front face as indicated by JP,1-230003,A and JP,9-269401,A. It is reported to JP,9-269401,A that the plastic lens whose ultraviolet-rays transmission in 400nm is 2.75% was obtained by this approach.

[0011] However, when this invention person inquires, since the physical properties on the front face of a lens change with ultraviolet ray absorbents, this sinking-in approach has the problem that adhesion with the rebound ace court layer and primer layer which are later formed in a lens front face falls. Moreover, although it is possible to use the rebound ace court layer which can be dyed, and to apply or infiltrate an ultraviolet ray absorbent into the front face of a rebound ace court layer, there is a problem that the abrasion-proof nature and endurance of a rebound ace court layer fall in that case. Furthermore, the plastics mainstream now at the high refractive index of acrylate (meta) and a thio urethane system has a bad dye affinity. Therefore, when it is going to infiltrate an ultraviolet ray absorbent into these lens front faces, there is a problem that workability falls since time amount is taken, or the yield falls since it is difficult to infiltrate homogeneity. Therefore, the sinking-in approach was not satisfactory in respect of quality and cost.

[0012] On the other hand, it scours, and after the crowded method adds an ultraviolet ray absorbent to the raw material monomer used as a plastic lens base material and is mixed to it as indicated by JP,1-230003,A, JP,5-164902,A, etc., it is an approach of obtaining the plastic lens with which a polymerization is performed in a glass mold and the ultraviolet ray absorbent was scoured.

[0013] However, in order [this] to scour and to make ultraviolet rays with a wavelength of 380–

400nm fully absorb by the crowded method, a quite high-concentration ultraviolet ray absorbent must be mixed to a raw material monomer. Therefore, there is a problem of coloring it yellow, so that it cannot use as a lens, as mentioned above. Moreover, there is a problem that an ultraviolet ray absorbent deposits on a front face depending on the class of ultraviolet ray absorbent, at the time of shaping. Moreover, adhesion with a glass mold worsens depending on the class of monomer, the imprint of a mold cannot be performed by the separation under polymerization, but there is a problem that a poor appearance and poor frequency arise. Furthermore, a monomer stops hardening depending on the combination of the class of monomer, and an ultraviolet ray absorbent, and it is known that a polymerization reaction will become an ununiformity.

[0014] Therefore, it was thought difficult to scour and to make an ultraviolet ray absorbent contain so much in a plastic lens by the crowded method conventionally as it was indicated that, as for giving the ultraviolet absorption capacity which scours and absorbs wavelength light 400nm or less to a plastic lens by the crowded method to JP,9-269401,A, it turned out that it is very difficult.

[0015] On the other hand, this invention person paid his attention to the molecular weight of an ultraviolet ray absorbent, in order [this] to scour and to make a plastic lens contain an ultraviolet ray absorbent so much by the crowded method. Namely, when making the same amount contain, if the molecular weight of an ultraviolet ray absorbent is small, the solubility over a raw material monomer will become high. And with [as a result of inquiring from the standpoint that increase in mole-ratio conversion and ultraviolet absorption ability improves / the molecular weight of an ultraviolet ray absorbent] 360 [or less] It checks scouring the ultraviolet ray absorbent of the amount which can fully absorb ultraviolet rays with a wavelength of 380–400nm depending on a raw material monomer that there are no troubles, such as a deposit, in a plastic lens, and putting it, and came to make this invention.

[0016] Therefore, invention according to claim 1 offers the ultraviolet absorption nature plastic lens with which molecular weight is characterized by containing 360 or less ultraviolet ray absorbent at a rate of 0.7 – 5 weight section to the raw material monomer 100 weight section.

[0017] Moreover, also in an ultraviolet ray absorbent, the compound of a benzotriazol system has a raw material monomer and good compatibility, and since it is rare to color a plastic lens yellow, it is a desirable ultraviolet ray absorbent.

[0018] Therefore, invention according to claim 2 offers the ultraviolet absorption nature plastic lens according to claim 1 said whose ultraviolet ray absorbent is a benzotriazol system compound.

[0019] Moreover, even if what uses mixture of the poly isocyanate compound and the Pori thiol compounds as a principal component made many ultraviolet ray absorbents contain also in said raw material monomer, it was admitted that a problem did not arise and it turned out that it is desirable.

[0020] Therefore, invention according to claim 3 offers the ultraviolet absorption nature plastic lens according to claim 1 or 2 with which said raw material monomer uses mixture of the poly isocyanate compound and the Pori thiol compounds as a principal component.

[0021] Moreover, when an ultraviolet ray absorbent is blended with a raw material monomer so much, in order to make homogeneity dissolve an ultraviolet ray absorbent in a raw material monomer, after adding an ultraviolet ray absorbent to a raw material monomer, the time amount mixed and stirred is required to some extent. On the other hand, if a polymerization catalyst is added to a raw material monomer, a polymerization reaction will advance and thicken gradually also in ordinary temperature. Therefore, before adding a polymerization catalyst rather than adding a polymerization catalyst and an ultraviolet ray absorbent to coincidence, by adding an ultraviolet ray absorbent to a raw material monomer, and mixing to it showed that the mixing time for dissolving an ultraviolet ray absorbent became short, and productivity became good.

[0022] Therefore, invention according to claim 4 offers the manufacture approach of the ultraviolet absorption nature plastic lens characterized by to have the 1st mixing process with which molecular weight mixes 360 or less ultraviolet ray absorbent at a rate of 0.7 – 5 weight section to the raw material monomer 100 weight section, the 2nd mixing process which adds a polymerization catalyst after said 1st mixing process, and the polymerization process to which

the polymerization of said raw material monomer is carried out after said 2nd mixing process.

[0023]

[Embodiment of the Invention] Hereafter, although the gestalt of operation of this invention is explained, this invention is not limited to the gestalt of the following operation.

[0024] As the ultraviolet absorption nature plastic lens of this invention was mentioned above, molecular weight contains 360 or less ultraviolet ray absorbent at a rate of 0.7 – 5 weight section to the raw material monomer 100 weight section.

[0025] Here, especially as a raw material monomer which can be used by this invention, although not restricted, what uses as a principal component mixture of the poly isocyanate compound which serves as thio urethane system resin, for example, and the Pori thiol compounds, an acrylate (meta) system compound, diethylene-glycol bisallyl carbonate, etc. can be illustrated.

[0026] As a poly isocyanate compound which is one raw material of thio urethane system resin For example, tolylene diisocyanate, diphenylmethane diisocyanate, Polymeric mold diphenylmethane diisocyanate, tolidine di-isocyanate, Naphthalene diisocyanate, hexamethylene di-isocyanate, isophorone diisocyanate, Xylylene diisocyanate, hydrogenation xylylene diisocyanate, hydro-diphenylmethane diisocyanate, Tetramethyl xylylene diisocyanate, 2, 5-screw (isocyanate methyl) bicyclo [2.2.1] heptane, 2, 6-screw (isocyanate methyl) bicyclo [2.2.1] heptane, 3, 8-screw (isocyanate methyl) tricyclo [5.2.1.02.6]-Deccan, 3, 9-screw (isocyanate methyl) tricyclo [5.2.1.02.6]-Deccan, 4, 8-screw (isocyanate methyl) tricyclo [5.2.1.02.6]-Deccan, 4, 9-screw (isocyanate methyl) tricyclo [5.2.1.02.6]-Deccan, The allophanate denaturation object of the poly isocyanate compounds, such as dimer acid diisocyanate, and those compounds, a buret denaturation object, and an isocyanurate denaturation object are mentioned, it is independent in these compounds, or two or more sorts can be mixed and used. In these poly isocyanate compounds, the compound of compatibility with an ultraviolet ray absorbent to an aromatic series system is desirable.

[0027] Especially as Pori thiol compounds which are another raw materials of thio urethane system resin, although not restricted, the 4-mercaptopethyl -3 shown, for example by the following formula (1), 6-dithio -1, 8-octane dithiol, the pentaerythritol tetrapod (3-mercaptopropionate) shown by the following formula (2), and the Pori thiol compounds which have four or more sulphydryl groups shown by the following general formula (3) can be illustrated.

[0028]

[Formula 1]



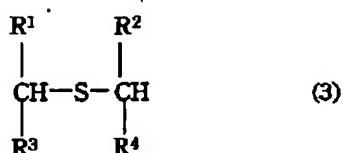
[0029]

[Formula 2]

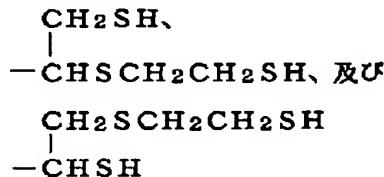


[0030]

[Formula 3]



(但し、式中、R¹、R²、R³、R⁴は、H、-CH₂SH、-CH₂SCH₂CH₂SH、

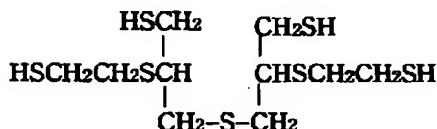
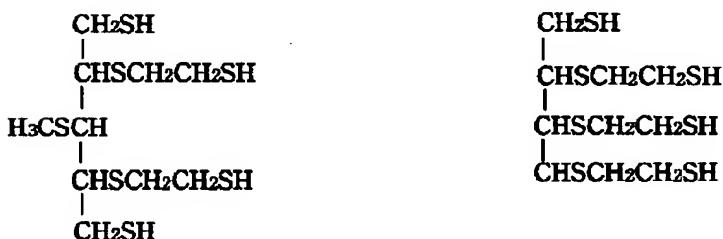
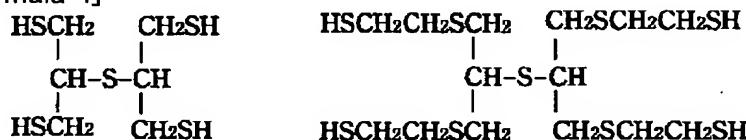


から選ばれ、分子中にSH基が4個以上存在する組み合わせである。)

[0031] As an example of the Pori thiol compounds shown by this general formula (3), the compound of the following structure expressions can be mentioned, for example.

[0032]

[Formula 4]



[0033] The range of NCO/SH(mole ratio) =0.5–3.0, especially 0.5–1.5 has [the mixed rate of the poly isocyanate compound and the Pori thiol compounds] the desirable rate of an isocyanate radical and the functional group of a thiol group.

[0034] Although the raw material monomer of thio urethane system resin uses these poly isocyanate compounds and Pori thiol compounds as a principal component, it can blend coloring agents, such as for example, an internal release agent, a chain elongation agent, a cross linking agent, light stabilizer, an antioxidant, a disperse dye, the oil color, and a pigment, a reaction catalyst, etc. into a raw material monomer as other components in addition to the ultraviolet ray absorbent mentioned later.

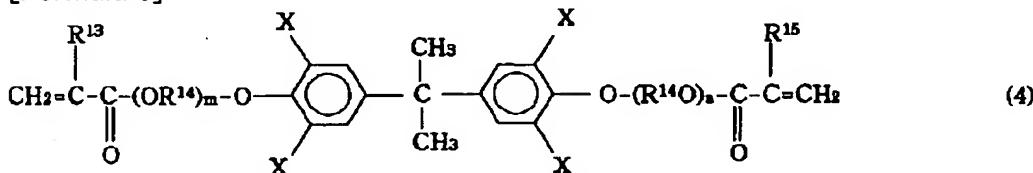
[0035] Thio urethane system resin has a refractive index and the high Abbe number, is equipped with the property that impact strength is also high, and is excellent as an ingredient of a plastic lens. Moreover, it is rare to dissolve an ultraviolet ray absorbent well and for an ultraviolet ray absorbent to deposit on a front face at the time of shaping. Moreover, adhesion with glass is so good that an internal release agent is needed, and even if it makes an ultraviolet ray absorbent contain by high concentration, when carrying out a polymerization by the glass mold, the phenomenon in which adhesion with a glass mold worsens is not generated, either, but since it

has the property that moreover no possibility that a polymerization may be checked with an ultraviolet ray absorbent is also almost, it excels most as a material of the ultraviolet absorption nature plastic lens of this invention.

[0036] Moreover, as an acrylate (meta) system compound of a raw material monomer, the acrylate system monomer shown by the following general formula (4) (meta) can be illustrated, and a plastic lens can be obtained by carrying out copolymerization to other polymerization nature monomers.

[0037]

[Formula 5]



[0038] (However, R13 shows a hydrogen atom or a methyl group among a formula, R14 shows a -CH₂CH₂-radical or a -CH₂CH(OH)CH₂-radical, X shows a hydrogen atom or the halogen atom except a fluorine, and m+n shows the integer of 0-8.)

As an example of the acrylate (meta) system monomer of a general formula (4), 2 and 2-screw (3 five - jib ROM-4-(meth)acryloyloxy ethoxy phenyl) propane, 2, and 2-screw (4-(meth)acryloyloxy ethoxy phenyl) propane, 2, and 2-screw [4-(beta-hydroxy-gamma-(meth)acryloyloxy) propoxy phenyl] propane etc. is raised.

[0039] As other polymerization nature monomers which carry out copolymerization to an acrylate (meta) system compound, moreover, styrene, Aromatic series monofunctional nature vinyl monomers, such as chloro styrene, bromostyrene, and alpha methyl styrene, Aromatic series polyfunctional vinyl monomers, such as a divinylbenzene or its chlorine, and a derivative by which bromination was carried out, Methyl (meta) acrylate, ethyl (meta) acrylate, 2-hydroxyethyl (meta) acrylate, Glycidyl methacrylate, benzyl methacrylate, phenoxy methacrylate, Monofunctional nature (meta) acrylate system monomers, such as cyclohexyl methacrylate, Ethylene GURIKORUJI (meta) acrylate, diethylene GURIKORUJI (meta) acrylate, TORIECHIRENGURIKORUJI (meta) acrylate, tetra-ethylene GURIKORUJI (meta) acrylate, Propylene GURIKORUJI (meta) acrylate, Zupro pyrene GURIKORUJI (meta) acrylate, Polyfunctional (meta) acrylic monomers, such as urethane (meta) acrylate obtained from the di(meth)acrylate, various isocyanate compounds and a hydroxyl group, or sulfhydryl group content (meta) acrylate of butanediol, Furthermore, thiol compounds of said formula (1), a formula (2), and a formula (3), pentaerythritol Thiol compounds, such as a tetrapod (mercapto acetate), can be used. These monomers are independent in one sort, or can also use two or more sorts for coincidence.

[0040] Other polymerization nature monomers have [the blending ratio of coal of the acrylate (meta) system monomer of said general formula (4), and other polymerization nature monomers / an acrylate (meta) system monomer] 80 - 20% of the weight of the desirable range 20 to 80% of the weight. Moreover, as components other than these raw material monomers, coloring agents, such as general photopolymerization initiators, such as a general thermal polymerization initiator and/or general acetophenone systems, such as organic peroxide and an azo compound, a benzoin system, and a benzophenone system, a cross linking agent, light stabilizer, an antioxidant, and a disperse dye, the oil color, a pigment, etc. can be suitably added in addition to the ultraviolet ray absorbent mentioned later.

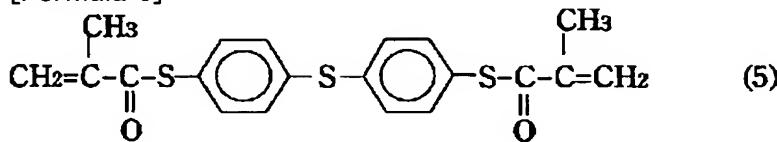
[0041] (Meta) The plastic lens of an acrylate system excels [refractive index] in flexural strength highly.

[0042] Moreover, the combination which obtains the copolymer of the acrylate system and/or vinyl system monomer which have a sulfur atom and an aromatic series ring in the molecular structure (meta), and other polymerization nature monomers as a raw material monomer can be mentioned. The compound expressed with the following type (5) and a general formula (6) as the acrylate system which has a sulfur atom and an aromatic series ring in the molecular structure

here (meta), and/or a vinyl system monomer is raised.

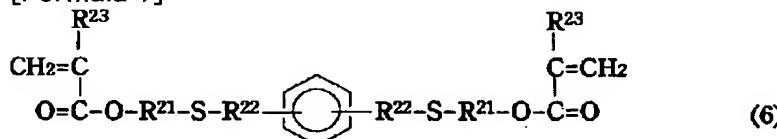
[0043]

[Formula 6]



[0044]

[Formula 7]



[0045] (R23 shows a hydrogen atom or a methyl group among a formula, and R21 and R22 show the alkylene group of carbon numbers 1–8, respectively.)

One sort, such as an aromatic series monofunctional nature vinyl monomer mentioned above as other polymerization nature monomers, an aromatic series polyfunctional vinyl monomer, a monofunctional nature (meta) acrylate system monomer, a polyfunctional (meta) acrylate system monomer, and thiol compounds, or two sorts or more can be used.

[0046] 80 – 20% of the weight of the range has [the acrylate system and/or vinyl system monomer which have a sulfur atom and an aromatic series ring in the molecular structure (meta)] the desirable polymerization nature monomer of 20 – 80 % of the weight, and others, and the compounding ratio of the acrylate system and/or vinyl system monomer which have a sulfur atom and an aromatic series ring in the molecular structure (meta), and other polymerization nature monomers can obtain the copolymer which excels [refractive index] in thermal resistance highly from these raw material monomers. As a raw material which can be blended in addition to the ultraviolet ray absorbent mentioned later, coloring agents, such as general photopolymerization initiators, such as a general thermal polymerization initiator and/or general acetophenone systems, such as organic peroxide and an azo compound, a benzoin system, and a benzophenone system, a cross linking agent, light stabilizer, an antioxidant, and a disperse dye, the oil color, a pigment, etc. can be added suitably, for example.

[0047] Moreover, in this invention, molecular weight uses 360 or less compound as an ultraviolet ray absorbent. If the ultraviolet ray absorbent with which molecular weight exceeds 360 is used, there is not ultraviolet absorption capacity sufficient in the critical mass which deposits on a plastic lens front face also with the loadings below 5 weight sections which the solubility to the inside of a raw material monomer falls, and are mentioned later, and does not deposit, the plastic lens which can fully absorb the ultraviolet rays of the wavelength which is 380–400nm cannot be obtained, and the purpose of this invention cannot be attained.

[0048] As 360 or less ultraviolet ray absorbent, a cyanoacrylate system, a salicylic-acid system, a benzophenone system, a benzotriazol system, etc. have molecular weight. As an ultraviolet ray absorbent of a cyanoacrylate system, it is ethyl-2-cyano, for example. – 3 and 3-diphenyl acrylate (molecular weight 277) can be illustrated. As a salicylic-acid system ultraviolet ray absorbent, a phenyl SARISHI rate (molecular weight 214), a 4-tert-buthylphenyl SARISHI rate (molecular weight 270), p-octyl phenyl SARISHI rate (molecular weight 326), etc. can be illustrated. As a benzophenone system ultraviolet ray absorbent, 2, 4-dihydroxy benzophenone (molecular weight 214), 2-hydroxy-4-methoxybenzophenone (molecular weight 228), 2-hydroxy-4-octyloxybenzophenone (molecular weight 326), – dihydroxy-4-methoxybenzophenone (molecular weight 224), and 2 and 2 '2, 2'-dihydroxy –4, a – dimethoxy benzophenone (molecular weight 274), 2, 2', and 4 '4, 4'-tetra-hydroxy benzophenone (molecular weight 246), etc. can be illustrated.

[0049] As a benzotriazol system ultraviolet ray absorbent For example, 2-(2-hydroxy-5-methylphenyl)-2H-benzotriazol (molecular weight 225), 2-(2-hydroxy-5-tert-buthylphenyl)

benzotriazol (molecular weight 250), 2-(2-hydroxy - 3, 5-JI and tert-buthylphenyl) benzotriazol (molecular weight 323), 2-(2-hydroxy-4-octyloxy phenyl)-2H-benzotriazol (molecular weight 339), 2-(2-hydroxy - 3, 5-JI and tert-amyl phenyl) benzotriazol (molecular weight 351), 5-chloro-2-(3, 5-G tert-butyl-2-hydroxyphenyl)-2H-benzotriazol (molecular weight 358), 2-(3-tert-butyl-2-hydroxy-5-methylphenyl)-5-chloro-2H-benzotriazol (molecular weight 316), 2-(3, 5-G tert-pentyl-2-hydroxyphenyl)-2H-benzotriazol (molecular weight 352), 2-(3, 5-G tert-butyl-2-hydroxyphenyl)-2H-benzotriazol (molecular weight 323), 2-(2-hydroxy-5-tert-octyl phenyl)-2H-benzotriazol (molecular weight 323), etc. can be illustrated.

[0050] In these ultraviolet ray absorbents, solubility [as opposed to a raw material monomer in a benzotriazol system] is good, and ultraviolet absorption capacity is high, and since the color in a compound simple substance is moreover equipped with light color or the description of it being white and being hard to color a lens, it is desirable. To the raw material monomer of thio urethane system resin, solubility is good, and since the standup of a spectral distribution curve becomes Sharp although the reason is moreover unknown, and the absorption coefficient of the wavelength of a light region falls, the effectiveness that the yellow taste of a lens decreases is also especially acquired. Also in a benzotriazol system, 2-(2-hydroxy-5-methylphenyl)-2H-benzotriazol (molecular weight 225) has a short substituent, and since it is rare for the solubility over a raw material monomer to be good, and to become yellow, since molecular weight is small, it is a desirable ultraviolet ray absorbent.

[0051] Therefore, as a desirable combination of a raw material monomer and an ultraviolet ray absorbent, the raw material monomer of the thio urethane system resin which uses mixture of the poly isocyanate compound and the Pori thiol compounds as a principal component, a benzotriazol system ultraviolet ray absorbent, especially 2-(2-hydroxy-5-methylphenyl)-2H-benzotriazol can be mentioned. Since it excels in compatibility in using the poly isocyanate compound of an aromatic series system especially, especially combination with this 2-(2-hydroxy-5-methylphenyl)-2H-benzotriazol is desirable.

[0052] the loadings of an ultraviolet ray absorbent -- the raw material monomer 100 weight section -- receiving -- 0.7 - 5 weight section -- it is 1 - 3 weight section preferably. Since the plastic lens which blended the ultraviolet ray absorbent in this range fully absorbs ultraviolet rays with a wavelength of 380-400nm and can absorb most all ultraviolet rays, it can protect an eye from ultraviolet rays. Specifically, average light transmission in a 300-400nm wavelength region can be made into less than 1% for the permeability of the 400nm ultraviolet rays of a lens with a thickness of 1mm less than 15%. If there are too many loadings of an ultraviolet ray absorbent, the dissolution to a raw material monomer will become difficult, and un-arranging [that an ultraviolet ray absorbent deposits, adhesion with a glass mold falls or a polymerization reaction is checked by the plastics range front face at the time of shaping] will arise.

[0053] Next, the manufacture approach of the ultraviolet absorption nature plastic lens of this invention has the 1st mixing process with which molecular weight mixes 360 or less ultraviolet ray absorbent at a rate of 0.7 - 5 weight section to the raw material monomer 100 weight section, the 2nd mixing process which adds a polymerization catalyst after this 1st mixing process, and the polymerization process to which the polymerization of said raw material monomer is carried out after the 2nd mixing process, as mentioned above.

[0054] That is, an ultraviolet ray absorbent is fully mixed with a raw material monomer before addition of a polymerization catalyst. When an ultraviolet ray absorbent is added at a rate mentioned above to the raw material monomer, in order to make it dissolve in homogeneity enough, stirring and mixing time are about [1 hour] need. The business time amount for stirring this ultraviolet ray absorbent and mixing is a process peculiar to this invention approach which blends an ultraviolet ray absorbent with a raw material monomer so much from before. Since a polymerization will advance gradually also in ordinary temperature if a polymerization catalyst is added to a raw material monomer, a raw material monomer solution thickens gradually.

Therefore, while stirring remarkable for dissolving an ultraviolet ray absorbent in homogeneity and mixing time are required because of the vicious circle which will require the time amount for the further dissolution for so much thickening if a polymerization catalyst and an ultraviolet ray absorbent are added to a raw material monomer and mixing time will start and productivity

worsens, the working life of a raw material monomer becomes short, and trouble is in production.

[0055] Therefore, according to the manufacture approach of the ultraviolet absorption nature plastic lens of this invention, a raw material is mixable with sufficient productivity.

[0056] The manufacture approach of this invention can be performed according to the manufacture approach of the usual plastic lens except the process which makes homogeneity dissolve an ultraviolet ray absorbent in a raw material monomer before adding a polymerization catalyst.

[0057] The 1st mixing process is a process which about 0.5 – 2-hour time amount is spent, usually fully mixes and stirs an ultraviolet ray absorbent in a raw material monomer, and is dissolved in homogeneity. It is desirable to also add and mix components other than a raw material monomer and an ultraviolet ray absorbent with an ultraviolet ray absorbent at this time.

[0058] A polymerization catalyst is added, mixed stirring is carried out, and a solution is made to dissolve a polymerization catalyst in the solution which the ultraviolet ray absorbent fully dissolved in the raw material monomer at the 2nd mixing process.

[0059] By the class of raw material monomer, and the polymerization method, the class of this polymerization catalyst is chosen suitably and restricted especially.

[0060] A polymerization raw material solution is preferably deaerated under a vacuum after the 2nd process. Next, a polymerization raw material solution is poured into the clearance between the mold of the polymerization mold which closed and held the side face of the glass mold of two upper and lower sides which have countered, for example with predetermined spacing with adhesive tape, and photopolymerization is carried out by thermal polymerization or UV irradiation with heating.

[0061] After a polymerization, a mold is disassembled, the plastics of a lens configuration is taken out, annealing can be performed after that, polymerization distortion can be removed, and a plastic lens base material can be obtained. Thus, the obtained ultraviolet absorption nature plastic lens is excellent in the absorptivity ability of the ultraviolet rays of full wave length, and can protect an eye from ultraviolet rays. Moreover, since the ultraviolet ray absorbent does not deposit on a front face, it has the engine performance which did not check adhesion with lenses, such as rebound ace court film formed after that, a primer layer, and an antireflection film, and was excellent.

[0062]

[Example] Hereafter, the example of this invention is explained.

[0063] [Example 1] As Pori thiol compounds, m-xylylene diisocyanate 94g and 0.15g of internal release agents were mixed as 4-mercaptopethyl-3, 6-dithio-1, and 8-octane dithiol 87g and a poly isocyanate compound, 2-(2-hydroxy-5-methylphenyl)-2H-benzotriazol (molecular weight 225) 2.72g (it is the 1.5 weight section to the raw material monomer 100 weight section) was mixed as an ultraviolet ray absorbent, and it fully stirred for about 1 hour. Then, dibutyltin dichloride 0.03g was added as a polymerization catalyst, and after making it dissolve, degassing was performed under the vacuum of 5mmHg for 60 minutes. Then, it poured in into the mold mold which consists of the glass mold and tape for lens shaping of -3.00D by 1.0mm of main thickness, the polymerization was performed in the heating furnace which holds for 7 hours and carries out [at 40 degrees C,] a temperature up over 10 hours from 40 degrees C to 120 degrees C after that, the glass mold after cooling and the tape were removed, and the sulfur-containing urethane system lens was obtained. Furthermore, annealing was performed at 120 degrees C for 2 hours, and internal distortion was removed.

[0064] The content of the ultraviolet ray absorbent of this plastic lens is 1.48 % of the weight. The obtained plastic lenses were a refractive index 1.66 and the Abbe number 32, and were the engine performance which does not have coloring, either and was excellent as a lens.

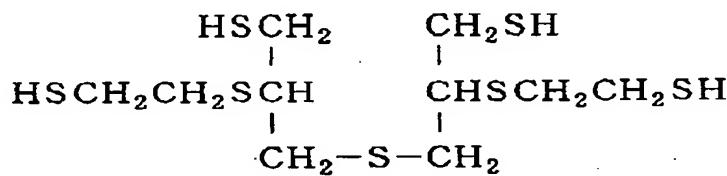
[0065] The spectral transmittance curve of the ultraviolet rays of this plastic lens is shown in A of drawing 1. According to this spectral transmittance curve A, the permeability of 400nm ultraviolet rays is about 8%, and having sufficient ultraviolet absorption ability is admitted. Moreover, there is also little absorption of the light, the permeability in 420nm is about 80%, and it is admitted that there is little coloring.

[0066] [Example 2] Three sorts of 4 organic-functions mercapto compounds expressed with m-xylylene diisocyanate 103g, the following structure expression (A), (B), and (C) as a poly isocyanate compound (the mixing ratio of A component, B component, and C component is a mole ratio, and is A/B/C=85/5/10)

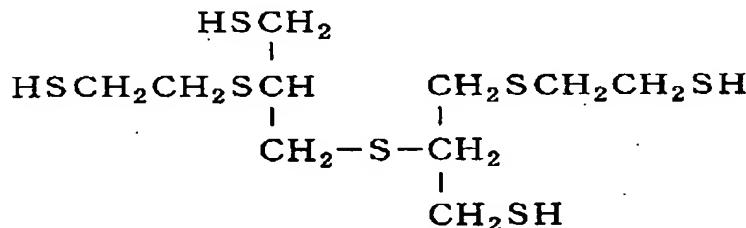
[0067]

[Formula 8]

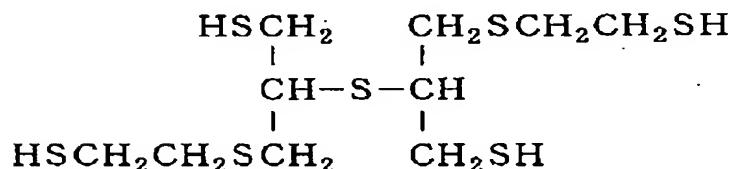
[A]



[B]



[C]



[0068] 2-(2-hydroxy-5-methylphenyl)-2H-benzotriazol 3.45g (it is the 1.7 weight section to the raw material monomer 100 weight section) was mixed as 100g, 0.15g of internal release agents, and an ultraviolet ray absorbent, and it fully stirred for about 1 hour. Then, dibutyltin dichloride 0.06g was added as a polymerization catalyst, and after making it dissolve, degassing was performed under the vacuum of 5mmHg for 60 minutes.

[0069] Then, it poured in into the mold mold which consists of the glass mold and tape for lens shaping of -3.00D by 1.0mm of main thickness, the polymerization was performed in the heating furnace which holds for 7 hours and carries out [at 40 degrees C,] a temperature up over 10 hours from 40 degrees C to 120 degrees C after that, the glass mold after cooling and the tape were removed, and the sulfur-containing urethane system lens was obtained. Furthermore, annealing was performed at 120 degrees C for 2 hours, and internal distortion was removed.

[0070] The content of the ultraviolet ray absorbent of this plastic lens is 1.67 % of the weight. The obtained plastic lenses were a refractive index 1.66 and the Abbe number 32, and spectral transmittance did not almost have coloring, either, while it is almost the same as an example 1 and was excellent in the absorptivity of the ultraviolet rays of full wave length.

[0071] [Example 3] As Pori thiol compounds, 4-mercaptomethyl -3, 6-dithio -1, and 8-octane dithiol 40g, As a poly isocyanate compound, 60g of hydro-diphenylmethane diisocyanate, 2-(2-hydroxy-5-tert-octyl phenyl)-2H-benzotriazol (molecular weight 323) 3.0g (they are 3 weight sections to the raw material monomer 100 weight section) was mixed as 0.15g of internal release agents, and an ultraviolet ray absorbent, and it fully stirred for about 1 hour. Then, dimethyl tin

dichloride 0.05g was added as a polymerization catalyst, and after making it dissolve, degassing was performed under the vacuum of 5mmHg for 60 minutes.

[0072] Then, it poured in into the mold mold which consists of the glass mold and tape for lens shaping of -3.00D by 1.0mm of main thickness, the polymerization was performed in the heating furnace which holds for 7 hours and carries out [at 40 degrees C,] a temperature up over 10 hours from 40 degrees C to 120 degrees C after that, the glass mold after cooling and the tape were removed, and the sulfur-containing urethane system lens was obtained. Furthermore, annealing was performed at 120 degrees C for 2 hours, and internal distortion was removed.

[0073] The content of the ultraviolet ray absorbent of this plastic lens is 2.9 % of the weight. They were a refractive index 1.60 and the Abbe number 42, the obtained plastic lens did not have a deposit of an ultraviolet ray absorbent, and its adhesion of the rebound ace court film and an antireflection film was also good.

[0074] [Example 1 of a comparison] The plastic lens was obtained like the example 1 in the example 1 except having changed the amount of ultraviolet ray absorbent 2-(2-hydroxy-5-methylphenyl)-2H-benzotriazol into 0.09g (it being the 0.05 weight section to the raw material monomer 100 weight section).

[0075] The curve of the spectral transmittance of the ultraviolet rays of the obtained plastic lens is shown in B of drawing 1. Although ultraviolet rays 380nm or less were completely absorbed from this spectral transmittance curve B, the permeability of 400nm ultraviolet rays was about 70%, and was inadequate for protection of an eye.

[0076] [Example 2 of a comparison] The plastic lens was obtained like the example 1 in the example 1 except changing an ultraviolet ray absorbent into 4-DODESHIROKISHI-2-hydroxy benzophenone (molecular weight 383) 7.24g. The ultraviolet ray absorbent deposited considerably on the obtained plastic lens front face.

[0077] [Example 3 of a comparison] After adding dibutyltin dichloride 0.03g into the mixed liquor of 4-mercaptopethyl -3, 6-dithio -1, and 8-octane dithiol 87g, m-xylylene diisocyanate 94g, and 0.15g of internal release agents as a polymerization catalyst and making it dissolve in it in the example 1, 2-(2-hydroxy-5-methylphenyl)-2H-benzotriazol 2.72g was mixed and stirred as an ultraviolet ray absorbent. The solution thickened and an ultraviolet ray absorbent did not dissolve in stirring of 1 hour, and mixing. The ultraviolet ray absorbent dissolved over the time amount of stirring of the usual more than twice, and mixing after all.

[0078]

[Effect of the Invention] The ultraviolet absorption nature plastic lens of this invention can absorb the ultraviolet rays of full wave length effectively, and can protect an eye from ultraviolet rays.

[0079] Moreover, according to the manufacture approach of the ultraviolet absorption nature plastic lens of this invention, this ultraviolet absorption nature plastic lens can be manufactured with sufficient productivity.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the graph which shows the spectral distribution curve of the plastic lens manufactured in the example 1 (A) and the example 1 of a comparison (B).

[Translation done.]

* NOTICES *

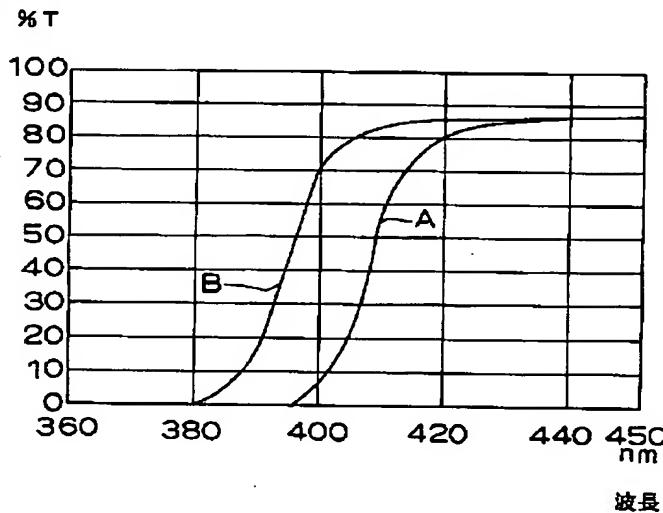
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DRAWINGS

[Drawing 1]

透過率



[Translation done.]